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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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MANELLI DENISON & SELTER
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EXAMINER	
SODERQUIST, ARLEN	
ART UNIT	**PAPER NUMBER**
1743	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/829,434	FAIRLIE ET AL.	
	Examiner	Art Unit	
	Arlen Soderquist	1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _09 February 2007_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _25-27,29-31,36,38-43,45-61,63,64,66 and 82-128_ is/are pending in the application.

4a) Of the above claim(s) _104-128_ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _25-27,29-31,36,38-43,45-61,63,64,66 and 82-103_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 25-27, 29-31, 36, 38-43, 45-61, 63-64, 66 and 82-103 are rejected under 35 U.S.C. 103(a) as obvious over Pritchard (US 5,592,028) in view of Scragg (US 4,084,038 newly cited and applied), Campbell (US 4,388,533 newly applied) and Takriti (US 6,021,402). In the patent Pritchard teaches a wind farm generation scheme utilizing electrolysis to create gaseous fuel for a constant output generator. In the device at least some of the power output from the wind farm is utilized to convert water into hydrogen, store and burn the hydrogen to produce energy, and use the energy from the burning for the generation of electricity. The means includes a plurality of electrolysis modules (hydrogen generators) consisting of electrolytic cells connected in series, with at least two modules connected in parallel by a switch means. Figure 1 shows a wind farm (1, renewable source of electric energy) which provides electrical power via a switch/transformer (2) to either the public utility grid (3) or an AC-DC converter/filter (4). By the fact that there are two possible paths for the electricity produced by the wind farm, a controller of the switch/transformer is required. Any resultant DC output of the wind farm after being suitably filtered by the AC-DC converter/filter, is fed to an electrolysis plant (5) where water is split into hydrogen and oxygen by the electrolysis modules. The hydrogen produced is sent through a pipe to a compressor (6) then into a purification plant (7) and then into hydrogen

storage means (8). After passing into the hydrogen storage means, the hydrogen may pass from the storage means to a hydrogen combustion/electrical generation plant (20). Alternatively, the hydrogen may pass from the storage means through a purification/liquefaction plant (9) into long term storage means (10). Again since there are multiple possibilities a controller is required to determine what happens to the hydrogen that is produced (storage to user or long term storage). The storage means should have sufficient capacity to accommodate short term variations in available wind energy (of the order of a few weeks). The long term storage means (10) should have sufficient capacity to accommodate seasonal variations. Outlet means (11) provide for delivery of liquid hydrogen. Outlet means at 12 provide for delivery of gaseous hydrogen. The electrical generation plant may incorporate means for burning hydrogen in air or stoichiometrically with oxygen. Various means of combustion may be employed. Non-limitative examples include a conventional steam boiler/steam turbine plant (21), direct generation of steam from the stoichiometric combustion of hydrogen with oxygen (22), an internal combustion engine (23), hydrogen gas turbine combustion (24) or a hydrogen fuel cell (25). All the means (21-25) would effect the turning of conventional electrical generating plant which would output electrical power to the grid. Figure 2 shows the electrolysis plant in more detail. The plant includes a number of voltage dependent switches (32) each connected to an electrolysis module (38) (a stack of electrolysis cells 35a, 35b . . . 35z connected in series). DC (+) current from the wind farm, smoothed by the filter is passed to a voltage dependent switch. The switch has a number of operating positions (34) and the switch includes control means arranged to cause it to adopt a particular position dependent on the voltage across it. The switch can be electro-mechanical or electronic such as a thyristor. In this case each cell of the module would be connected via a thyristor to the voltage supplied with only one thyristor open at a time to determine the number of cells operating, viz if the thyristor connected to the sixth cell is open the voltage is supplied to the first six cells. The electrolysis cells have an optimum operating voltage at which they operate with maximum efficiency. Depending on cell construction this optimum operating voltage is normally between 1.5 and 2.0 volts at room temperature. The voltage switch is arranged to ensure that each cell receives the correct voltage across it to ensure maximum efficiency by energizing the correct number of cells. For example if the voltage measured between the input and ground is 16 volts and the electrolysis cells have an optimum

operating voltage of 1.6 volts then the switch is arranged to automatically move to a position where the 16 volts is supplied across 10 electrolysis cells. Each of the 10 cells then has a voltage of 1.6 volts across it: if the measured voltage changed to 19 volts then the switch would move to energize a further two cells making a total of 12 energized cells, each of which would have a voltage of 1.58 volts (close to the optimum) across it. In the preferred embodiment, the transition between switch positions is done so as to avoid losses due to spike effects and the switch response time is matched to the temporal (real time) characteristics of the filter. Although not indicated in the figure, a means may be provided to monitor the current density through each module and thereby provide feedback to the switch control means (the control means is connected to the electricity generator and collects data that is used by the controller to control the switches). Column 4, lines 36-49 teach that the invention allows for much longer periodic smoothing of the wind energy availability curve. The result of this is to allow a more reliable design for wind farms based upon seasonal or annual mean wind speed figures (at least related to the availability of power). The invention will permit, in principle, wind energy to contribute up to a 100% of total grid power, limited only by the total energy available in the local wind regime. All electrolysis products are initially put into the various storage means, and the electrolysis plant is made capable of accepting any power input up to the maximum rated, power of the wind plant. This can greatly simplify the design of the wind energy conversion plant as complex electro/mechanical output control is unnecessary. The wind farm could be designed to produce DC, and therefore hydrogen, at all times and may never have a direct connection to the grid. Column 2, lines 37-38 teach that preferably the system includes control means to monitor (collect data) and control the system. From the rest of the summary of the invention it is clear that the system includes the wind farm, the hydrogen generator the hydrogen storage means and the means to convert the hydrogen into electrical energy. As such the control means would have inherently been connected to the wind farm energy source to collect data as a part of its being able to monitor and control the system since using the hydrogen to generate electricity to put into the grid when the power from the wind farm is not sufficient to meet the needs/demand of the grid is part of the intended purpose of reducing the power variation form the wind farm power source. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the control means to monitor the electricity from the wind farm to be

able to control the electrical generation plant when the power needs are not being met by the wind farm. Pritchard does not teach a more involved computer based control system or the factors/variation in conditions that would have controlled the production and storage of hydrogen in the system.

In the patent Scragg teaches an electrical power generation and storage system. Columns 1-2 teach that in the process of generating electric power by conventional power generating systems, e.g., hydro-electric, steam turbine, gas turbine, diesel, or gas engine systems, each system, if operated at a constant power level, operates inefficiently during periods because of variable load factors typically encountered. For example, the load factor may vary, in a typical household, from 100 watts per hour between midnight and 5:00 A.M. to 25,000 watts per hour between 6:00 A.M. to 9:00 A.M. and 3:00 P.M. to 7:00 P.M. The load factor in a commercial office building may vary from 10,000 watts per hour between 6:00 P.M. to 8:00 A.M. and increase to 100,000 watts per hour between 8:00 A.M. to 6:00 P.M. As is known in the art varying conditions cause load factors which vary not only on a daily basis but also on a seasonal basis. In the case of the typical household, it would require a 25,000 watt generator running 24 hours a day to produce the necessary power to meet the relatively short duration peak loads as well as minimum loads which typically exist for a longer period of time, thus producing a total of 600,000 watts in 24 hours. However, the typical household utilizes less than a total of 200,000 watts in this 24 hour period. Due to these varying load factors, all sources of power generation, whether large megawatt generators or smaller on site generators, have periods in which the demand is for the total generating capacity followed by periods of surplus generating capacity. If the surplus energy could be efficiently stored, the peak power generating capacity and/or spinning capacity could be reduced thereby reducing the capital equipment and fuel required to generate a given amount of electricity. In the alternative, the power generating equipment used to meet peak demand would operate only during the relatively short peak demand intervals with the excess power generated being stored, then utilized during other non-peak demand intervals. Fuel cells of several types and hydrogen-oxygen batteries have been developed which are utilized in the conversion of gases to generate direct current electricity with efficiencies which range from 60% up to as high as 98%. Further, hydrogen reform process plants have been developed which are utilized to produce high purity hydrogen at efficiencies of

40% when fired directly by fuel gas, and can produce high purity hydrogen at greater efficiencies with external steam supply. Accordingly, the invention relates to a process for generating and temporarily storing generated electrical energy during periods of less than peak demand in the form of electro-chemical chemical and electro-mechanical mediums. As the demand for electrical energy increases, the stored energy is reconverted back to AC electrical energy for utilization by consumers.

In the patent Campbell teaches a power generation system for supplying electrical power to an external power demand load. Figure 11 is a schematic view illustrating the overall control of the system. from the figure and its associated description beginning on column 11, line 38, the output from the electrical power generator unit (12) is connected to a power distribution network (130) which selectively connects the output of unit 12 to the external power demand load, the internal system demand load and the fuel generator (90). The fuel generator is an electrolysis unit. The distribution network has a built-in inverter so that direct current can be supplied to the fuel generator and alternating current can be supplied to the external power demand load. The network monitors the output of the generator unit and the external power demand load. When the output of generator unit exceeds the external power demand load and the internal system demand load, the network supplies enough of the output of the generator unit to satisfy these demand loads and routes the remaining output to the fuel generator to generate hydrogen for storage. The fuel generator is controlled by a fuel control circuit (131) connected to water level sensor (132), the water inlet valve (96), and the pumps (104 and 108) of the electrolysis unit. As power is supplied to the fuel generator from the power distribution network, oxygen and hydrogen gas will evolve and the water level in the electrolysis unit will be lowered. When the water level has been lowered a prescribed amount, the water level sensor will be tripped. This causes the fuel control circuit to open the water inlet valve to raise the water level in the electrolysis unit while at the same time causing pump 104 to pump the generated hydrogen gas to storage tanks (91) through the distribution valve assembly (105) and pump 108 to pump the generated oxygen out. When the water level has been raised back to the desired level, sensor 132 is operated to cause fuel control circuit to close the water inlet valve and stop pumps 104 and 108. The overall operation of the system is controlled from a microprocessor (computer) MPU connected to the power distribution network, the fuel control circuit, the distribution valve

assembly, the horizontal sun tracking control circuit and the vertical sun tracking control circuit. The microprocessor MPU is also connected to a sunlight monitor (134), a wind monitor (135), and a fuel level monitor (136). The microprocessor is programmed so that when the solar isolation detected by sunlight monitor is below a predetermined threshold level, the microprocessor MPU will disable the sun tracking control circuits. If the fuel level monitor indicates hydrogen is available from storage tanks (91), then the microprocessor MPU operates the distribution valve assembly so that the hydrogen from the tanks is supplied to a burner assembly (56) for burning in air to heat the air and operate the power generator unit 12. The microprocessor MPU monitors the output of the generator unit, the internal system demand load and the external power demand load and controls distribution the valve assembly so that just enough hydrogen is supplied to the burner assembly to operate the generator unit so that its output equals the internal system demand load and the external power demand load. A similar use of hydrogen occurs when there in not enough solar energy to run the generator unit at a level which satisfies the internal system demand load and the external power demand load. As soon as the level of solar isolation detected by the sunlight monitor is sufficient to operate the generator unit at a level which at least satisfies the internal system demand load and the external system demand load, the microprocessor MPU operates the distribution valve assembly to connect the outlet pipe from the fuel generator to the storage tanks and cut off the fuel supplied to burner assembly. The fuel control circuit is enabled so that hydrogen will be generated and stored using the excess output of the power generator unit.

In the patent Takriti teaches a computer implemented risk-management system for scheduling the generating units of an electric utility while taking into consideration power trading with other utilities and the stochastic load on the utility system. The system provides the user with a tool that generates multiple load forecasts and allows the user to vary the fuel price between the different scenarios and the different periods of the planning horizon. The tool allows the user to model accurately the uncertain trading transactions and the changing fuel prices to meet the electric demand of customers at a minimal cost while making the maximum profit possible from power trading. The tool also allows the user to apply any set of linear constraints to fuels. A mathematical model of the problem is solved to provide the status of each generator at each time period of the planning horizon under each given scenario, the load on each

generator during each period in which it is operating, an optimal fuel mix for each generating unit, and the prices for purchasing and selling power in the periods of the planning horizon. In the background given in columns 1-4, Takriti discusses the different types of electrical generating devices including boilers using steam to turn a turbine and quick start generators using fuel heating of air to turn the turbine and produce electricity. This section also discusses the difference in cost and operating efficiency of these types of electricity producers. Both the boiler and quick start types of electricity generators are found in the hydrogen combustion/electricity generation plant of Pritchard.

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a computer/microprocessor based control system as taught by Campbell in the Pritchard system because of the ability to both monitor and control the various aspects of power generation and hydrogen production and use based on demand and the variations in the demand and the ability of the power generator unit to produce power during daily and long term seasonal cycles as shown by Campbell, Scragg and Pritchard. It further would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a control/risk management system as taught by Takriti into the Pritchard device /system because of the ability or predict the need for various inputs such as the daily cycles of Scragg or the seasonal variations of Pritchard in combination with their cost, thereby reducing the cost/risk of operating the system as taught by Takriti since the Pritchard system included components for electricity generation that are included and controlled by the system of Takriti.

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting

ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claims 25-27, 29-31, 36, 38-43, 45-61, 63-64, 66 and 82-103 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-167 of U.S. Patent No. 6,745,105. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims are of a scope that the patented claims are within the instant claim scope and one cannot practice the patented invention without practicing the instant invention.

6. Claims 25-27, 38-39, 42, 47-48, 50-52, 66, 84-89 and 91-92 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4 and 7-21 of U.S. Patent No. 7,181,316 (newly cited and applied). Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims are of a scope that the patented claims are within the instant claim scope or substantially equivalent to the instant claim scope and one cannot practice the patented invention without practicing the instant invention.

7. Applicant's arguments filed February 9, 2007 have been fully considered but they are not persuasive. In response to the arguments, examiner has included two new references in the rejection that clearly show that a computer would have been an obvious means to serve as the control means the monitor and control the Pritchard system. The Campbell reference clearly shows that a computer system can monitor the amount of power produced by a power generating unit and control a hydrogen generation and storage structure to produce hydrogen and store it when the power generation unit produces more that sufficient power to supply its external and internal demand. This same controller uses hydrogen from storage to supplement the energy o the power generation unit when it is not capable of meeting the external and internal demand for power. Since this is exactly what the system of Pritchard is doing, the controller of Campbell would have been recognized as an obvious choice to provide the system control that Pritchard teaches as preferred in column 2, lines 37-38. Pritchard clearly teaches the ability to smooth out

short term and long term variations in the ability of the wind farm to meet the demand of the external grid. The Scragg reference clearly shows that there are daily variations in this demand and that these daily demands can more efficiently be met by using excess power during times of low demand to convert the excess power into a form such as hydrogen that can efficiently be used to produce electricity at times of excess demand. This reference clearly shows that one of ordinary skill in the art would have recognized that there are various levels of power needed through the day and incorporated these cycles into a system for operating a power generation facility. This added to the combination of Pritchard and Takriti by showing that there are factors known to those of ordinary skill in the art related to the operation of a power generation unit that would need to be considered in the production and utilization of power to produce and store hydrogen or release stored hydrogen to produce power. Takriti shows that there are various considerations that go into the efficient operation of an electric power system that uses different means to produce power. Thus the factors of Takriti would have been recognized as applicable to the system of Prichard since the control of Takriti is intended to be applied to an electricity producing system that includes a number of different types of electricity producers. These include conventional boilers using a fuel source to heat water and create steam for driving a turbine to produce electricity and quick start generators using a fuel to directly heat air that drives a turbine to produce electricity. It is clear that the system of Pritchard includes a control system. It is also clear that the electricity generation in Pritchard includes conventional boilers and quick start type generators to generate electricity. Thus due to the expected differences in cost of production and requirements for startup as taught by Takriti for the different types of electricity generators, one of ordinary skill in the art would have recognized the need to use a controller such as taught by Takriti in the Pritchard system to optimize the cost of production and need to produce the energy among the different types of electricity generators present in the Pritchard system. As such there is a clear link between the two references and a clear benefit that would have motivated one of ordinary skill in the art to apply the risk management type of control system to the Pritchard system. It is noted that a terminal disclaimer was submitted. The terminal disclaimer has not at this point been reviewed and examiner is maintaining the obviousness-type double patenting rejection. A new obviousness-type double patenting rejection has been made. Acceptance of the terminal disclaimer will overcome the maintained rejection.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited references deal with power and/or hydrogen producing/generating systems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose telephone number is (571) 272-1265. The examiner can normally be reached on Monday-Thursday and Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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